PARAMETER TRANSDUCER - ANALYZER

P10 TYPE

SERVICE MANUAL

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1. APPLICATION

The P10 transducer-analyzer is destined to measure voltages and currents in a three or four-wire power network, in symmetric or asymmetric systems and enables the conversion of network parameters into four standard analog current signals.

The RS-485 interface with the MODBUS transmission protocol makes possible the application of this P10 transducer-analyzer in computer systems.

This transducer enables the measurement of root-mean-square values of voltage and current, active, reactive, apparent power and energy, power factors, frequency, active and average power e.g. 15 min., harmonic distorsion coefficients for each phase and harmonic measurement from 1 to 25 th. Moreover, this P10 transducer-analyzer shows the real time and the time of extremal value occurences.

It has 4 relay outputs and 3 two-state inputs to switch the rate of energy counters.

The P10 transducer-analyzer is destined for producers and distributors of electrical energy and individual users.

Quantities measured and calculated by the P10 transducer-analyzer:

• phase voltages	U1, U2, U3,
• phase-to-phase voltages	U12, U23, U31,
• average three-phase voltage	Us
• average phase-to-phase voltage	Umf
• average three-phase current	Is
• phase currents	I1, I2, I3
• phase active powers	P1, P2, P3,
• phase reactive powers	Q1, Q2, Q3,
• phase apparent powers	S1, S2, S3,
• phase active power factors	Pf1, Pf2, Pf3,
• ratio between reactive and active power factors	tgφ1, tgφ2, tgφ3
• average three-phase power factors	Pf, tgφ
• phase power factors	tgφ1, tgφ2, tgφ3
• three-phase active, reactive and apparent powers	P, Q, S
• average active power, e.g. 15 min.	PAV
• three-phase active, reactive and apparent energy in four rates (tariffs)	Ept1-4, Eqt 1-4, Est 1-4
• frequency	f
• full coefficients of distorsion by harmonics for phase voltages and phase currents	THDU1, THDU2, THDU3, THDI1, THDI2, THDI3,
• phase voltage and phase current harmonics	up to 25th

Maximal and minimal values accessible with the date and time of their occurence are measured for all quantities. Additionally, there is the possibility to adapt the P10 transducer-analyzer to external measuring transformers. The updating time of all accessible quantities does not exceed 1 second. All quantities and configurating parameters are accessible through the RS-485 interface.

2. DELIVERY SET - OPERATIONAL SAFETY

With the P10 transducer-analyzer we deliver:

- a service manual,
- a guarantee card,
- 3 bolts to fix the transducer on a wall.

In case of the execution with a serial interface, we deliver additionally:

- a service manual of the serial interface,
- a service manual of the WizPar program,
- a diskette named „WizPar Visualization Program".

When unpacking the P10 transducer-analyzer, please check whether the type and execution code on the data plate correspond to the order.

Symbols located in this service manual mean:

Especially important. One must acquaint with this before connecting the instrument.

Read carefully. One must take note of this when the instrument is working inconsistently to the expectations.

P10 transducer-analyzers are destined to be mounted on panels or walls.
In the range of operational safety they are in conformity with the IEC 1010 standard requirements.

Remarks concerning the operator safety:

- The installation and meter connection should be operated by qualified personnel.
- One must take into consideration all accessible protection requirements.
- Before switching the instrument on, one must check the correctness of the network lead connection.
- In case of the protection terminal connection with a separate lead one must remember to connect it before the connection of network leads.
- Do not connect the transducer to the network through an autotransformer.
- Before taking the transducer housing out one must turn the supply off.
- The removal of the transducer housing during the guarantee period may cause its cancellation.

3. INSTALLATION

3.1 Fitting way.

P10 transducer-analyzers are adapted to be installed on a DIN rail or on a wall by means of bolts.

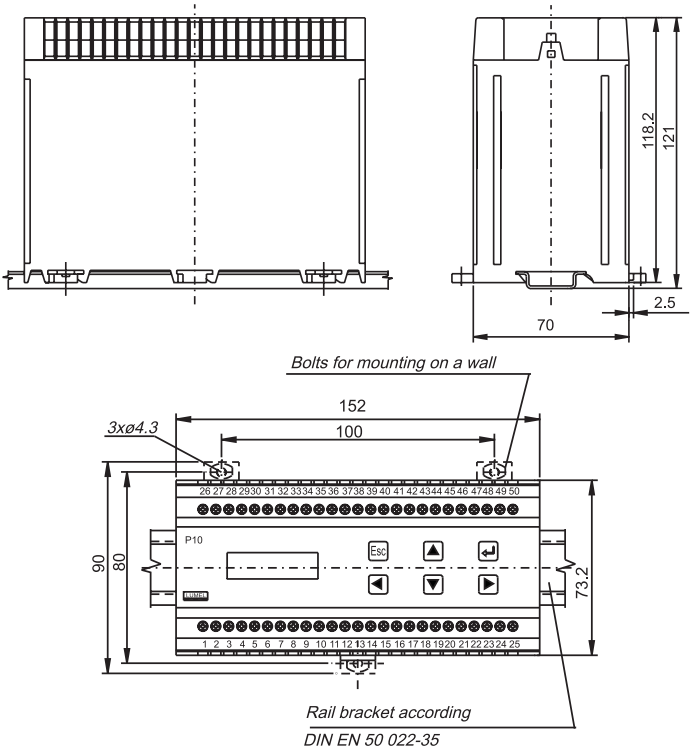
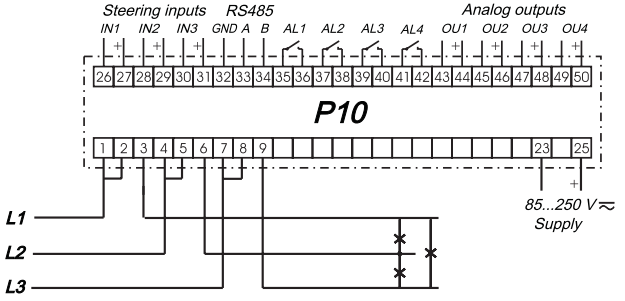


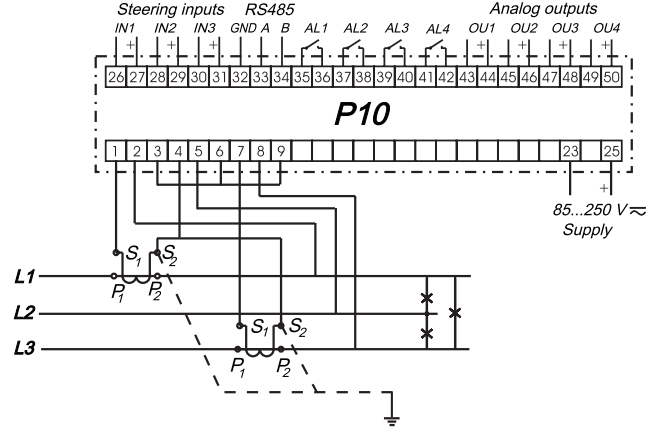
Fig. 1. External dimensions and fitting way on a wall

3.2. External connection diagrams

Direct measurement in a three-phase network



Half-intermediate measurement via 2 current transformers in a three-phase network



Intermediate measurement via 3 current transformers and 2 or 3 voltage transformers in a 3-phase network.

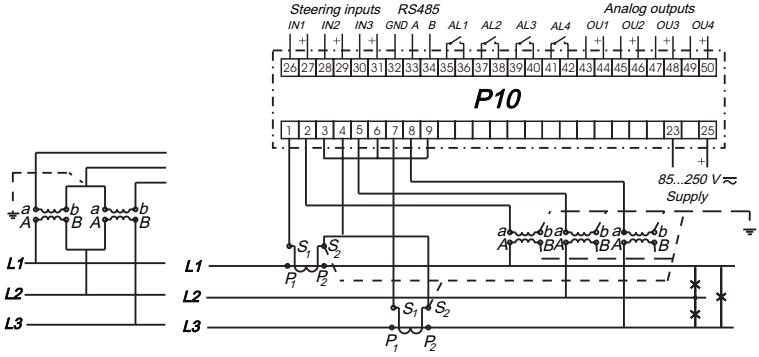
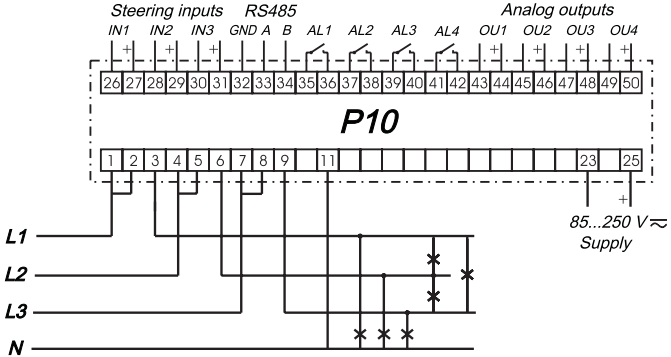
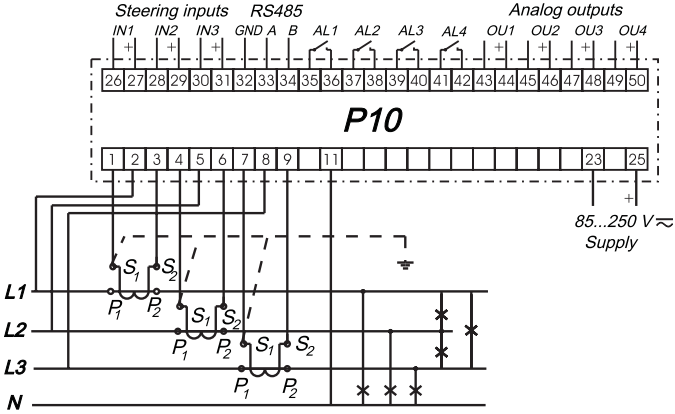


Fig. 2. Connection diagrams of the P10 transducer - analyzer in a three-phase network

Direct measurement in a four-wire network



Half-intermediate measurement in a four-wire network via 3 current transformers



Intermediate measurement via 3 current transformers and 2 or 3 voltage transformers in a four-wire network.

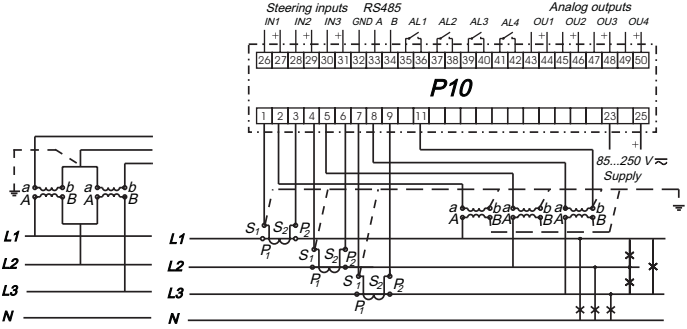
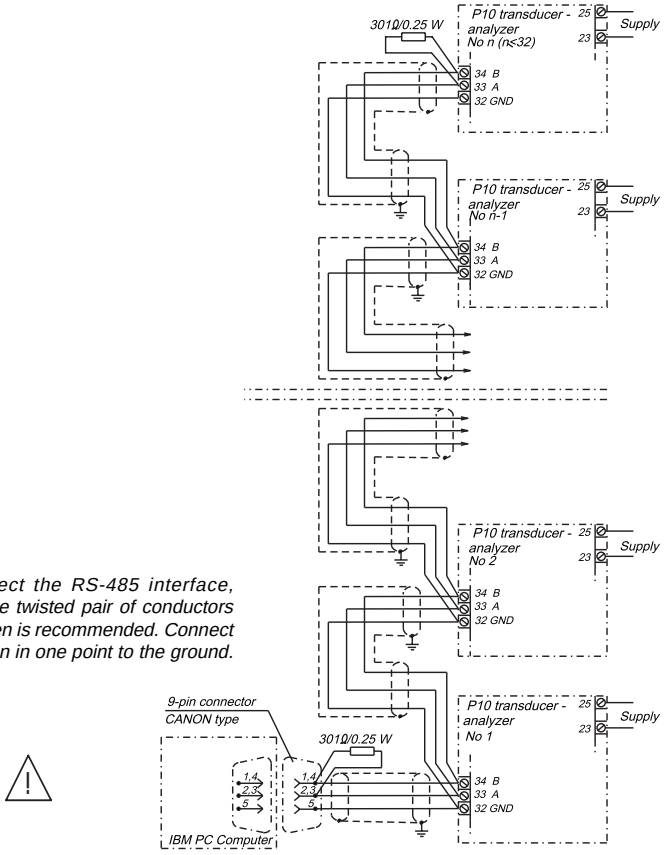


Fig. 3. Connection diagrams of the P10 transducer-analyzer in a four-wire network.



Note:

To connect the RS-485 interface, (a double twisted pair of conductors in a screen is recommended. Connect the screen in one point to the ground.

Fig. 8. Connection way of the RS-485 interface

4. PROGRAMMING

4.1. Faceplate description

Fig. 5. View of the P10 transducer-analyzer

The P10 transducer-analyzer has 6 functional keys and an LCD 2 x 16 character display. Parameter values are compiled in two lines. By means of keys, the user can choose any optional quantity.

The assignement of each key is as follows.

↵	Acceptation key - ENTER
▶	Key to displace to the right
▼	Key to decrease the value
▲	Key to increase the value
◀	Key to displace to the left
Esc	Clearing key - Esc

↵ key - in the programming mode: acceptation of the introduced value.

◀ ▶ keys - in the measurement mode, these keys allow to displace on the two-dimensional parameter table.
- in the programming mode they enable the position change of the cursor and allow to control the display contrast

▼ ▲ keys - in the measurement mode, these keys allow to displace on the two-dimensional parameter table
- in the programming mode, they serve to change the introduced value

Esc key - this key enables the resignation in any moment of the operation

In the measurement mode the display has the following view:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
n	n	n					A	I		a	a	a	a		
	x	x	x	x	x		v	v	v	v	v				

nnn - name of the quantity acc. the table No 2

xxxxxx - value

vvvvv - unit

aaaa - state of relay outputs (— - non active, output number — - active)

4.2 Working modes of P10 transducer-analyzers

The P10 transducer-analyzer has 5 working modes, set down in the table 1.

Working modes Table 1

Mode		Calling	
Name	**Calling symbol**	**Input**	**Output**
Measuring		assumptive	Through the input to another mode
Clock setting	**RTC Time**	In SETUP procedure	Esc, or ↵ after the last parameter
Parameter configuration	**Parameters**	In SETUP procedure	Esc, or ↵ after the last parameter
Alarm programming	**Alarms**	In SETUP procedure	Esc, or ↵ after the last parameter
Analog output programming	**Analog Outputs**	In SETUP procedure	Esc, or ↵ after the last parameter

After the transducer-analyzer switching on, the following message is reported.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
P	1	0		v	.	x	x			L	U	M	E	L	
	y	y	/	m	m	/	d	d			h	h	:	m	m

where:

v.xx - is the number of the current program version

yy/mm/dd - defines the current date

hh:mm - current hour

After making tests, the transducer-analyzer transits into the measuring mode and the last set quantity is indicated

The entry into the SETUP procedure follows after pressing ◀ ▶ keys during 3 seconds. The entry into the other modes is carried out by the SETUP procedure. By means of ▲ ▼ keys one must choose the suitable mode „RTC Time", „Parameters", „Alarms", „Analog Outputs" and accept the chosen mode by the ↵ key.

The return from other modes to the measuring mode is carried out by the Esc or ↵ key after the last parameter.

4.2.1. Measuring mode

In the measuring mode the quantity value is displayed according the table settled by the manufacturer.

The quantity change is carried out by means of ◀ ▼ ▲ ▶ keys. Quantities displayed in the measuring mode.

Table 2

			Pav							
U12	U1	I1	P1	Q1	S1	PF1	tg1	f	HU1	HI1
U23	U2	I2	P2	Q2	S2	PF2	tg2	f	HU2	HI2
U31	U3	I3	P3	Q3	S3	PF3	tg3	f	HU3	HI3
UPP	U	I	P	Q	S	PF	tg	f		
			Ept1	Eqt1	Est1					
			Ept2	Eqt2	Est2					
			Ept3	Eqt3	Est3					
			Ept4	Eqt4	Est4					

Quantity names, symbols and units Table 3

Item	Quantity name	Symbol	Unit
1	lack of quantity	off	
2	L1-L2 phase-to-phase voltage	U12	(M,k)V
3	L2-L3 phase-to-phase voltage	U23	(M,k)V
4	L3-L1 phase-to-phase voltage	U31	(M,k)V
5	average phase-to-phase voltage	UPP	(M,k)V
6	L1 phase voltage	U1	(M,k)v
7	L2 phase voltage	U2	(M,k)V
8	L3 phase voltage	U3	(M,k)V
9	average 3-phase voltage	U	(M,k)V
10	Current in L1 phase line	I1	(k)A
11	Current in L1 phase line	I2	(k)A
12	Current in L1 phase line	I3	(k)A
13	average 3-phase current	I	(k)A
14	average active power	Pav	(G,M,k)W
15	active power of L1 phase	P1	(G,M,k)W
16	active power of L2 phase	P2	(G,M,k)W
17	active power of L3 phase	P3	(G,M,k)W
18	3-phase active power	P	(G,M,k)W
19	3-phase active energy - Tariff 1	Ept1	(G,M,k)Wh
20	3-phase active energy - Tariff 2	Ept2	(G,M,k)Wh
21	3-phase active energy - Tariff 3	Ept3	(G,M,k)Wh
22	3-phase active energy - Tariff 4	Ept4	(G,M,k)Wh
23	Reactive power of L1 phase	Q1	(G,M,k)Var
24	Reactive power of L2 phase	Q2	(G,M,k)Var
25	Reactive power of L3 phase	Q3	(G,M,k)Var
26	3-phase reactive power	Q	(G,M,k)Var
27	3-phase reactive energy - Tariff 1	Eqt1	(G,M,k)Varh
28	3-phase reactive energy - Tariff 2	Eqt2	(G,M,k)Varh
29	3-phase reactive energy - Tariff 3	Eqt3	(G,M,k)Varh
30	3-phase reactive energy - Tariff 4	Eqt4	(G,M,k)Varh

Quantity names, symbols and units

Table 3 (continuation)

Item	Quantity name	Symbol	Unit
31	Apparent power of L1 phase	S1	G,M,k)VA
32	Apparent power of L2 phase	S2	(G,M,k)VA
33	Apparent power of L3 phase	S3	(G,M,k)VA
34	3-phase apperent power	S	(G,M,k)VA
35	3-phase apperent energy - Tariff 1	Est1	(G,M,k)VAh
36	3-phase apperent energy - Tariff 2	Est2	(G,M,k)VAh
37	3-phase apperent energy - Tariff 3	Est3	(G,M,k)VAh
38	3-phase apperent energy - Tariff 4	Est4	(G,M,k)VAh
39	L1 phase power factor	PF1	
40	L2 phase power factor	PF2	
41	L3 phase power factor	PF3	
42	3-phase power factor	PF	
43	tgφ coefficient of L1 phase	tg1	
44	tgφ coefficient of L2 phase	tg2	
45	tgφ coefficient of L3 phase	tg3	
46	3-phase tgφ coefficient	tg	
47	THD coefficient of L1 phase voltage	HU1-THD	%
48	THD coefficient of L2 phase voltage	HU2-THD	%
49	THD coefficient of L3 phase voltage	HU3-THD	%
50	THD coefficient of L3 phase cuurent	HI1-THD	%
51	THD coefficient of L3 phase cuurent	HI2-THD	%
22	THD coefficient of L3 phase cuurent	HI3-THD	%
53	frequency	f	Hz

4.2.1.1. Extreme values

The monitoring of minimal and maximal values is carried out when after pressing the ↵ and ▲ or ▼ keys, the following message is shown on the display:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
z		y	y	/	m	m	/	d	d		h	h	:	m	m
	x	x	x	x	x		v	v	v	v	v				

z - ↑ maximum sign, ↓ minimum sign
yy/mm/dd - date of extremum occurence
hh:mm - time of extremum occurence
xxxxxx - value
vvvvv - unit

The clearing of external values follows after pressing the Esc key during their monitoring.

Note:
The clearing of external values of the Pav parameter follows after zeroing them in the PARAMETERS mode.

4.2.1.2 Measurement of current and voltage harmonics

The choice of harmonics is carried out by pressing Esc and ↵ during 3 sec. THD coefficients values and harmonic contents from 2 up to 25th can be reviewed by means of ◀ ▼ ▲ ▶ keys moving on the two-dimensional coefficient table.

Harmonics displayed in the measuring mode. Table 4

HU1-THD		HU1-04 HU1-05	HU1-06 HU1-07	...	HU1-24 HU1-25
HU2-THD	HU2-02 HU2-03	HU2-04 HU2-05	HU2-06 HU2-07	...	HU2-24 HU2-25
HU3-THD	HU3-02 HU3-03	HU3-04 HU3-05	HU3-06 HU3-07	...	HU3-24 HU3-25
HI1-THD	HI1-02 HI1-03	HI1-04 HI1-05	HI1-06 HI1-07	...	HI1-24 HI1-25
HI2-THD	HI2-02 HI2-03	HI2-04 HI2-05	HI2-06 HI2-07	...	HI2-24 HI2-25
HI3-THD	HI3-02 HI3-03	HI3-04 HI3-05	HI3-06 HI3-07	...	HI3-24 HI3-25

The key ↵ enables the displacement downwards of 3 positions. This function enables simultaneously to follow harmonic values for currents and voltages of the same phase.

4.2.2. Setups of the RTC Time

After the entry into the SETUP procedure one must choose the RTC mode by means of ▲ ▼ keys and press the ↵ key. The following values are displayed:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
R	T	C		T	i	m	e								
	y	y	/	m	m	/	d	d		h	h	:	m	m	

where:

yy - year
mm - month
dd - day
hh - hour
mm - minute

Required parameters can be set up by means of ◀ ▼ ▲ ▶ keys, the quantity by the ◀ or ▶ key, and the digit value by the ▲ or ▼. key.
The active position is signalled by the cursor. One must accept settled values by the ↵ key or resign by pressing the Esc key and back to the measuring mode.

4.2.3. Configuration of PARAMETERS parameters

This mode serves to settle transducer-analyzer parameters. The entry into the configuration mode is protected by the access code if a code different from zero has been introduced. For the code 0000, the inquiry for the password is omitted. If the access code is different from zero, there is the possibility to review parameters but changes are blocked.

In the configuration mode quantities acc. the table 5 are settled

Set of parameters Table 5

Item	Parameter name	Designation	Range	Assumptive value
1	Introduction of the access code	Password?	0000...9999	0000
2	Setup of transducer manufacturer's parameters	Set Defaults?	Y,N	N
3	Ratio of the current transformer	I Ratio	1...20000	1
4	Ratio of the voltage transformer	U Ratio	1...4000	1
5	Cancellation of the counters	Clear E*t?	Y,N	N
6	Cancellation of the Pav power averaged time (e.g. 15 min), Pav (max and min. value)	Clear Pav	Y,N	N
7	Averaging time of the Pav power	Pav Time	15, 30, 60	15
8	Synchronization of Pav power averaging Pav - through the clock, - through the moving window	Pav Window?	Synchro, Moving	Synchro
9	Transducer address in the network	Slave Address	0,1,...,247	1

Item	Parameter name	Designation	Range	Assumptive value
10	Serial interface rate	Baud Rate	600, 1200, 2400, 4800, 9600, 19200	19200
11	Mode of the MODBUS interface	Modbus Mode	off, 8n1 ASCII, 7e1 ASCII, 7o1 ASCII, 8n2 RTU, 8e1 RTU, 8o1 RTU	8n2 RTU
12	Change of access code	Password	0000,..., 9999	0000

Designations :

n - (no parity), lack of parity
e - (even parity), bit of parity control
o - (odd parity), bit of odd parity control.

Required values are settled in the configuration mode by means of ◀ ▼ ▲ ▶ keys. The active position is marked off by the cursor. The settled quantity can be accepted by the ↵ key or cancelled by the Esc key. The pressure of the ↵ key causes the setup on the successive parameter, and after the last parameter, remembers the set up values and causes the exit from the Parameters mode.

Note: *When changing the working mode and the interface baud rate, the transducer reset follows.*

4.2.4. Programming of Alarms

Any arbitrary quantity of the group of 41 parameters (table 8) can be assigned to the alarm output.

Moreover, it is possible to:
- set up the switch on tresholds,
- set up the switch off tresholds,
- settle the delay

Alarms mode — Table 6

Item	Parameter name	Designation	Range	Assumptive value
1	Two-state output 1 - quantity	Alarm1 Param	table 8	I1
2	Two-state output 1 - switch on	Alarm1 On	-120...0...120[%]	101
3	Two-state output 1 - switch off value	Alarm1Off	-120...0...120[%]	99
4	Two-state output 2 - quantity	Alarm2 Param	table 8	I2
5	Two-state output 2 - switch on	Alarm2 On	-120...0...120[%]	101
6	Two-state output 1 - switch off value	Alarm2 Off	-120...0...120[%]	99
7	Two-state output 3 - quantity	Alarm3 Param	table 8	I3
8	Two-state output 3 - switch on	Alarm3On	-120...0...120[%]	101
9	Two-state output 3 - switch off value	Alarm3 Off	-120...0...120[%]	99
10	Two-state output 4 - quantity	Alarm4 Param	table 8	I
11	Two-state output 4 - switch on	Alarm4 On	-120...0...120[%]	101
12	Two-state output 3 - switch off value	Alarm4 Off	-120...0...120[%]	99
13	Delay in alarm operation	Alarms Delay	0...100 [s]	0

Example:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	l	a	r	m	1		P	a	r	a	m				
									U	1					

The voltage of phase 1 has been assigned to the 1st relay output

4.2.5. Programming of Analog Outputs

A continuous output current signal can be assigned to any arbitrary measured or calculated quantity from the group of 41 parameters.

Moreover, it is possible to:

- set up the changing window of the input signal,
- choose the current range: 0...20, 4...20, 0...5, 0...10 mA

Set of Analog Outputs mode parameters — Table 7

Item	Parameter name	Designation	Range	Assumptive value
1	Quantity on the continuous output No 1	AnOut1 Param	table 8	off
2	Lower value of the input range	AnOut1 Low [%]	-120...0...120	0
3	Upper value of the input range	AnOut1 Hi [%]	-120...0...120	100
4	Continuous output type	AnOut1 Zero [mA]	0, 4, 5, 10	4
5	Quantity on the continuous output No 2	AnOut2 Param	table 8	off
6	Lower value of the input range	AnOut2 Low [%]	-120...0...120	0
7	Upper value of the input range	AnOut2 Hi [%]	-120...0...120	100
8	Continuous output type	AnOut2 Zero [mA]	0, 4, 5, 10	4
9	Quantity on the continuous output No 3	AnOut3 Param	table 8	0ff
10	Lower value of the input range	AnOut3 Low [%]	-120...0...120	100
11	Upper value of the input range	AnOut3 Hi [%]	-120...0...120	100
12	Continuous output type	AnOut3 Zero [mA]	0, 4, 5, 10	4
13	Quantity on the continuous output No 4	AnOut4 Param	table 8	off
14	Lower value of the input range	AnOut4 Low [%]	-120...0...120	0
15	Upper value of the input range	AnOut4 Hi [%]	-120...0...120	100
16	Continuous output type	AnOut4 Zero [mA]	0, 4, 5, 10	4

Note: the analog output type is designed by:

0 - defines the current output 0... 20 mA range
4 - defines the current output 4... 20 mA range
5 - defines the current output 0... 5 mA range
10 - defines the current output 0... 10 mA range

Tablica 8

Code	Designation	Quantity
40	OFF	lack of quantity
39	U1	L1 phase voltage
38	I1	current in the L1 phase line
37	P1	L1 phase active power
36	Q1	L1 phase reactive power
35	S1	L1 phase apperent power
34	PF1	L1 phase power factor
33	tg1	L1 phase tgφ coefficient
32	U2	L2 phase voltage
31	I2	current in the L2 phase line
30	P2	L2 phase active power
29	Q2	L2 phase reactive power
28	S2	L2 phase apperent power
27	PF2	L2 phase power factor
26	tg2	L2 phase tgφ coefficient
25	U3	L3 phase voltage
24	I3	current in the L3 phase line
23	P3	L3 phase active power
22	Q3	L3 phase reactive power
21	S3	L3 phase apperent power
20	PF3	L3 phase power factor
19	tg3	L3 phase tgφ coefficient
18	U	average 3-phase voltage
17	I	average 3-phase current
16	P	three-phase active power
15	Q	three-phase reactive power
14	S	three-phase apperent power
13	PF	three-phase power factor

Table 8 (continuation)

Code	Designation	Quantity
12	tg	3-phase tgφ coefficient
11	f	frequency
10	U12	L1-L2 phase-to-phase voltage
9	U23	L2-L3 phase-to-phase voltage
8	U31	L3-L1phase-to-phase voltage
7	UPP	average phase-to-phase voltage
6	Pav	average active power
5	HU1	THD coefficient by harmonic of L1 phase voltage
4	HU2	THD coefficient by harmonic of L2 phase voltage
3	HU3	THD coefficient by harmonic of L3 phase voltage
2	HI1	THD coefficient by harmonic of L2 phase current
1	HI2	THD coefficient by harmonic of L1 phase current
0	HI3	THD coefficient by harmonic of L3 phase current

5. ENTRY TO THE TARIFF CHANGE

Steering inputs to the tariff change have a constant function - the tariff switching. Tariffs are used for the counting of the 3-phase tariff energy (four tariff energy counters, Ept_i ,Eqt_i ,Est_i). When there is a lack of signals on outputs, the energy is counted in Ept_1 , Eqt_1 ,Est_1. counters. The signal switching on successive outputs causes the switch-over of the counters.

Input 1	Input 2	Input 3	Tariff
0	0	0	tariff 1
1	0	0	tariff 2
0	1	0	tariff 3
0	0	1	tariff 4

where:

1 - steering voltage: 24 V ±50%

0 - lack of steering voltage

Working modes of the P10 transducer-analyzer.

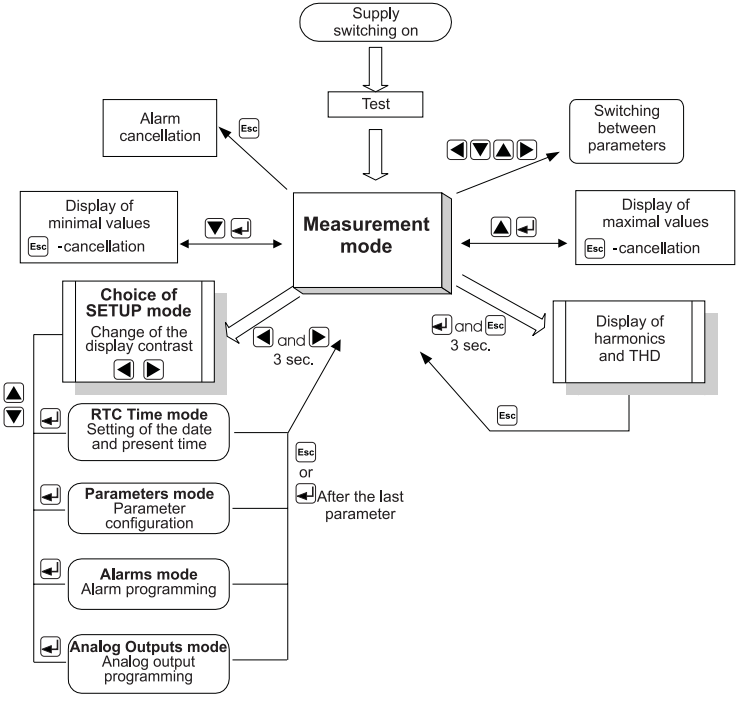


Fig.6. Working modes of the P10 transducer

6. ERROR CODES

During the transducer-analyzer operation, messages about errors can occur. Error causes are described below:

Invalid Value - when during measurementg the voltage or current is too small

Pf_i , $t\varphi_i$	below 5% Un below 5% In
f	below 5% Un

- the full interval of the Pav power averaging time is not expired,

Invalid Min - Lack of possibility to define the minimal value.
(lack of current, usually after the transducer switching on or cancellation the extremes).

Invalid Max - Lack of possibility to define the maximal value.
(lack of current, usually after the transducer switching on or cancellation the extremes).

For THD and harmonic measurements

U out of range - voltage under 10% U_n

I out of range - current under 10% I_n

f out of range - frequency out of the 47...52 Hz range

7. TECHNICAL SPECIFICATIONS

Measuring ranges and admissible measuring errors are shown in the table 9.

Table 9

Measured quantity	Range	Basic error	Remarks
Voltage U_i	100.0 V (Ku=1) 400.0 V (Ku=1) for Ku≠1:....400 kV	±(0.2% m.v. +0.1% of range)	Ku=1...4000 (max 400 kV)
Current I_i	1.000 A (Ki=1) 5.000 A (Ki=1) for Ki≠1:....20.00 kA	±(0.2% m.v. +0.1% of range)	Ki=1...20000 (max 20 kA)
Active power P_i **Mean active powerP_{AV}** **Active energy EnP**	0.0...(-)1999.9 (Wh) for Ku≠1, Ki≠1 ...(-)1999.9 MW (MWh)	±(0.5% m.v. +0.2% of range)	
Reactive power Q_i **Reactive energy EnQ**	0.0...(-)1999.9 (Varh) for Ku≠1, Ki≠1 ...(-)1999.9 MVar (MVarh)	±(0.5% m.v. +0.2% of range)	
Apparent power S_i **Apparent energy EnS**	0.0...(-)1999.9 (VAh) for Ku≠1, Ki≠1 ...(-)1999.9 MVA (MVAh)	±(0.5% w.m +0.2% of range)	
Active power factor Pf_i	-1.00...0.00 ... 1.00	±1% m.v. ±2c	Pf=Power factor=P/S
Coefficient $tg\varphi_i$	-99.99...0...99.99	±1% m.v. ±2c	error in the range -60...0...+60°
Frequency f	20.0...500.0 Hz	±0.5% m.v.	
THD U, THD I **Harmonics**	0.2...100 %	±5% m.v. ±2c	error in the range 10...120% U, I 47...52 Hz

where:

Ku - voltage transformer ratio

Ki - current transformer ratio

THD U - full coefficient of distortion by voltage harmonics

THD I - full coefficient of distortion by current harmonics

m.v. - measured value

c - the smallest gignificant digit of the display

Power consumption	
- in the supply circuit	≤ 10 VA
- in the voltage circuit	≤ 0.2 VA
- in the current circuit	≤ 0.1 VA
Supply voltage	85...250 V DC or AC, 40...400 Hz
Read-out field	display: LCD 2 x 16 characters
Analog output	4 outputs 0...20 mA, 4...20 mA, 0...5 mA, 0...10 mA accuracy: 0.2%
Relay outputs	4 relays: voltageless make contacts load capacity: 250 V~ / 0.5 A~
Steering input	3 inputs 0/24 V DC ±50% to steer 4 energy counter tariffs
Serial interface	RS 485
Transmission protocol	MODBUS

Transducer - analyzer reaction about supply decays and returns:

- preservation of data and transducer state during decays (accumulator support)
- continuation of operation after the supply return

Protection grade ensured by the housing:

- screw terminals	IP 20
- housing	IP 40
Weight	0.7 kg
Dimensions	152 x 73.2 x 118.2 mm
Fitting	on a 35 mm DIN rail
Maximal lead cross-section	4 mm^2

Reference conditions and rating operating conditions

- input signal:	0...0.01...1.2 I_n; 0...0.01...1.2 U_n; for voltage, current, power and energy **in a 4-wire network**
	0...0.01...1.2 I_n; 0...0.1...1.2 U_n; for voltage, current, power and energy **in a 3-wire network**
	0...0.1...1.2 U_n for frequency,
	0...0.05...1.2 I_n; 0...0.05...1.2 U_n; for Pf and tφ coefficients, frequency 45...65; sinusoidal (THD ≤ 8%)
	0.1...1.2 I_n ; 0.1...1.2 U_n ; 47...52 Hz ; for THD U, THD I and harminics
- power factor	-1...0...1
- ambient temperature	0...23...55°C
- humidity	25...95% (condensation inadmissible)
- supply	85...250 V DC or AC, 40...400 Hz
- admissible peak factor:	
- current	2
- voltage	2
- storage temperature	-20...85°C
- external magnetic field	0...40...400 A/m
- overload of short duration (5 sec.)	
- voltage inputs	2 U_n (max.1000 V)
- current inputs	10 I_n
- working position	optional
- heating time	5 min.

Additional errors

in % of the basic error
- from ambient temperature
  changes: < 50%/10°C

Standards fulfilled by the transducer-analyzer:

Electromagnetic compatibility:

- immunity acc. EN-50082-2 (1996)
- emission acc. EN50081-2 (1996)
- harmonic measurement acc. EN50160

Security requirements:

in compliance with IEC 1010-1+A1 (1996):
- insulation ensured by the housing: double,
- insulation between circuits: basic,
- installation category: III,
- pollution degree: 2,
- maximal working voltage in relation to the earth: 600 V AC

8. EXECUTION CODES

Table 10

Transducer - analyzer P10	X	X	X	XX	X
Input current In:					
1 A (X/1)	**1**				
5 A (X/5)	**2**				
as per order*	**9**				
Input phase voltage Un:					
100 V		**1**			
400 V		**2**			
as per order*		**9**			
Digital output:					
without interface			**0**		
with an RS485 interface			**1**		
Supply voltage:					
85...250 V DC or AC, 40...400 Hz				**0**	
as per order*				**9**	
Kind of executions:					
standard				**00**	
custom-made				**XX**	
Acceptance tests:					
without additional requirements					**0**
with a quality inspection certificate					**1**
as per customer's agreements**					**X**

* *after agreement with the manufacturer*

** *the code number will be settle by the manufacturer*

ORDERING EXAMPLE:

code **P10-2-1-1-0-00-1**-means: a P10 transducer - analyzer with a 5 A input current, input phase voltage: 100V, RS-485 interface, supply voltage: 85...250 V DC / AC, standard execution and with a quality inspection certificate.

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